State of California — Business, Transportation and Housing Agency

Memorandum

To: ALL DISTRICT DIVISION CHIEFS
Project Development

and

MR. JAMES E. ROBERTS, Director
Engineering Service Center

Date: December 19, 1995

File No.:

From: DEPARTMENT OF TRANSPORTATION
DIVISION OF STATE AND LOCAL PROJECT DEVELOPMENT PROGRAM

Subject: Design Information Bulletin Number 78 - Design Checklist

PURPOSE

To aid in the planning, design, and review of geometric plans for highway improvement projects.

DISTRIBUTION

It is recommended that copies of Design Information Bulletin Number 78 be distributed to all Project Engineers and Oversight Engineers.

BACKGROUND

The Design Checklist supersedes Design Information Bulletin Number 66. The Design Checklist has been updated to reflect the Fifth Edition of the Highway Design Manual (July, 1995 Metric Edition). This includes changes to, and additions of, standards as well as metrication. The Design Checklist has been enhanced to cover basic design criteria, as well as geometric design.

APPLICATION

The use of the Design Checklist is strictly optional. It has been provided as another tool to assist designers in making appropriate design decisions.

It would be useful while:

- developing geometric plans
- comparing alternatives in the planning stage
- reviewing plans prepared by local agencies or their consultants
- identifying non-standard features requiring design exceptions

The Design Checklist does not include all design standards and is not intended to be a substitute for the Highway Design Manual. The Design Engineer will continue to be responsible for all standards included in the Highway Design Manual.

If you have any comments or suggested revisions of this Design Checklist, please send them to Alan Glen, Chief, Office of State Geometric Design Standards.

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DESIGN INFORMATION BULLETIN NUMBER 78

California Department of Transportation
State and Local Project Development Program
Office of State Geometric Design Standards

DESIGN CHECKLIST

APPROVED BY:

12/19/95

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Program Manager
State & Local Project Development

December, 1995

DATE_____

DIST - CO - RTE KP/KP

SOURCE No. - EA

Project Description _____

Project Engineer _____

DESIGN CHECKLIST

A CHECKLIST FOR THE DEVELOPMENT OF GEOMETRIC PLANS
TO BE USED IN THE
PLANNING AND DESIGN OF HIGHWAY IMPROVEMENT PROJECTS

This checklist is to be used in conjunction with the Fifth Edition of the Highway Design Manual (July, 1995 Metric Edition). The pertinent sections are shown in parenthesis following the question. Some questions may not apply to each project.

INSTRUCTIONS: Items with a "no" answer need written justification.

Design features or elements which deviate from mandatory standards require approval of the State & Local Project Development Program Manager. This approval authority has been delegated to the Project Development Coordinators. (I - 82.2(1))(M)

The authority to approve exceptions to advisory standards has been delegated to the District Directors. (I - 82.2(2))

(M) - Mandatory Standards
(A) - Advisory Standards
(I) - Index
(T) - Table
(F) - Figure

I. Basic Design Criteria

Standards and Policies to be established prior to geometric plan development.

A. Design Speed and Sight Distance Criteria (Topic 101 & Topic 201)(M)

1. Design Speed and corresponding sight distances for the highway facilities within the project limits:

Route/ Street	Design Speed (km/h)	Stop. SD (m)	Decision SD (m)	Corner SD (m)

a. Interstate
b. State highway
c. Local road

2. Have these design speeds been concurred by:

   a. Project Development Coordinator and Geometrician
   b. Local Agency representative on PDT (when applicable)

3. Are these design speeds documented in an engineering report, such as PSR or PR, or in the project file?

B. Design Period (I - 103.2)

1. What is the Design Period for this project? _____ years (do not base solely on the year for which forecasted traffic is readily available)

   a. If a period other than 20 years (except Safety, RRR, or operational improvement projects), is selected, have the following approved?

      1.) Project Development Coordinator
      2.) District Director

   b. Design year is _____

C. Design Capacity (I - 102.1)

1. What Level of Service (LOS) is to be maintained over the design period? (List various highway facilities and LOS below)

Highway Facility (mainline, ramp, local road)	Design Year / LOS
a.	/
b.	/
c.	/

D. Clear Recovery Zone (I - 309.1(2)) (A)

Based on the recommended widths of Index 309.1, anticipated traffic volumes, operating speeds, terrain, and costs, specify the clear recovery zone (CRZ) width for each different type of facility affected by the project:

Highway Facility	CRZ
Freeways/Expressways	
Ramps past gore area	
Conventional Highways (no curbs)	
Conventional Highways (with curbs)	

For lengthy projects, CRZ widths may change with terrain; specify Post Mile limits if different values are appropriate.

E. Design Vehicle Selection (I - 404.2)

In accordance with Index 404.2, determine which design vehicle is to be used as the basis of intersection design. The designer must first determine if each highway facility within the project is on the "National Network" created by the STAA of 1982. Indicate one of the following:

STAA _____, California _____, Bus _____

II. Geometric Design Criteria

Design standards and policies to be incorporated into project plans.

A. Vertical Alignment

1. Sight Distance Criteria

a. Is the project devoid of sustained downgrades steeper than 3% and longer than 2 km? If not, has the Stopping Sight Distance used to design the affected highway segment been increased by 20% ? (I - 201.3)(A)

b. Does each crest vertical curve provide the required Stopping Sight Distance? (I & F-201.4)(M)

c. On two-lane highways, does each crest vertical curve provide adequate passing sight distance? (I & T - 201.1)(M)

d. At each grade sag, does the length of vertical curve provide headlight sight distance? (I & F-201.5)(M)

e. If no, has lighting been considered as mitigation? (I - 201.5)

f. On freeways and expressways, is decision sight distance provided at lane drops and at off-ramp noses? (I - 201.7)(A)

2. Grade Standards

   a. Does the entire profile grade comply with the maximums specified in Table 204.3? (I - 204.3)(M)

   b. Does the profile grade exceed the minimums of 0.5% for snow country and 0.3% at other locations? (I - 204.3)(A)

   c. Do ramp grades comply with the maximums stated in Index 204.3 and Index 504.2(5)? (A)

3. Vertical Curve Criteria

   a. Do the lengths of vertical curves exceed: (I - 204.4)

      1.) 2V if design speeds are $\geq$ 60 km/h and A is $\geq$ 2%? (A)

      2) 60 m if design speeds are < 60 km/h or A is < 2%? (A)

   b. On 2-lane highways, are crest vertical curves less than 1 km in length? (I - 204.4)

4. Climbing Lane Requirements

   a. Is the profile devoid of sustained upgrades exceeding 2% where the total rise exceeds 15 m? (I-204.5)

   b. If no, has the need for a climbing lane been investigated? (I & F - 204.5)

   c. If determined to be necessary, has the HQ Traffic Operations Reviewer reviewed the design of the climbing lane? (I - 204.5(3))

   d. Is decision sight distance (T - 201.7) provided at climbing lane drops on freeways? (I - 204.5(2))(A)

5. Structure Grade Lines

   a. Have structure depth, falsework depth and vertical clearance requirements been considered in profile design? (I & T - 204.6)(M)

   b. Where grade lines are depressed under structures, has the sag been located to avoid conflicts between structure footings and drainage facilities? (I-204.6(3))

   c. Where the grade line on bridges is constant or tangent, is it 0.3% or greater? (I - 204.6(4))

d. Where the grade line on a bridge includes a vertical curve, is there a fall of at least 10 mm per 20 m and does the stated minimum extend for a length of no more than 30 m? (I - 204.6(4))

e. Is the vertical falsework clearance over traffic at least 4.6 m ? (I - 204.6(5))(M)

B. Horizontal Alignment

1. Do all curve radii exceed the minimum values listed in Table 203.2 for the appropriate design speed?

2. Is the minimum Stopping Sight Distance provided at each horizontal curve? (I - 203.1 & F - 201.6)(M)

3. If central angle is less than 10 degrees, is the curve length 240 m or greater? (I-203.4)

4. Is the curve length on 2-lane roads between 150 m and 800 m? (I-203.4)

5. Where compound curves are necessary, is the shorter radius, R_1,at least two thirds the longer radius, R_2 (when $R_1 < 300$ m)? (I-203.5)(A)

6. Is the intervening tangent between reversing curves long enough to accommodate standard superelevation transition runoffs? (F - 202.5)(A)
Is it at least long enough for the 4% maximum per 20 m rate of change? (I-203.6)(A)
When feasible, is a minimum 120 m tangent provided?

7. On freeways and expressways, is decision sight distance provided at lane drops and at off-ramp noses? (I - 201.7)(A)

8. For local facilities within State right of way with no connection to an access controlled facility, does the horizontal alignment conform to AASHTO standards? (I - 203.1)(M)
If the local agency standards exceed AASHTO standards, do the local standards prevail? (A)

9. For freeways and expressways, are a minimum of 1500 m and 900 m radius curves used in rural and urban areas respectively? (I-203.2)

C. Alignment Consistency

1. Is the variance in design speed between successive curves less than 15 km/h? (applicable only when a curve's design speed is less than that selected for the project) (I - 203.3)(A)

2. Does each horizontal curve which is located at the end of a long tangent and/or steep downgrade meet or exceed the design speed of the previous curve? (I - 203.3)(A)

3. Are the horizontal and vertical alignments coordinated such that horizontal curves are not hidden behind crest vertical curves?

4. Where horizontal and vertical curves are superimposed at grade sags or summits in mountainous or rolling terrain, is the design speed of the horizontal curve at least equal to the vertical curve's design speed? Is the horizontal curve design speed no more than 15 km/h less than the estimated or measured running speed of the approach roadway? (I - 204.7)(A)

D. Superelevation

1. For all horizontal curves, is the superelevation rate specified in Table 202.2 used? (M)

2. Is a superelevation rate of 8% or less used where snow and ice conditions prevail, typically above elevations of 900 m? (T- 202.2)(M)

3. On rural 2-lane roads, is the standard superelevation rate carried across the full width of the traveled way and shoulders, except on transitions? (I-202.2)(A)

4. Has adverse superelevation been avoided in;

   a. The gore area of exit ramps which "curve back" to parallel the mainline facility?

   b. Warping street or ramp surface areas for drainage? (I - 202.3)(A)

5. For undivided highways, has the axis of rotation been selected to improve perception of curves (i.e. Desert roads) and to avoid drainage pockets at superelevated highway sections (which usually occur in flat terrain)? (I - 202.4(1))

6. Is the superelevation transition designed in accordance with the diagram and tabular data shown in Figure 202.5? (I - 202.5(1))(A)

7. Where standard superelevation transition is not attainable (restrictive situations), has the rate of change of the cross slope been limited to 4% per 20 m? (I - 202.5 (3))(A)

8. Have the profiles for edge of traveled way and shoulders been plotted to identify irregularities resulting from the interaction of the super transition and the vertical alignment of the roadway? Have the irregularities been eliminated by introducing smooth curves?

9. Does two-thirds of each superelevation runoff length occur on the tangent which precedes or follows the curve, and does one-third occur within the curve? (I - 202.5(2)(A)

10. Can superelevation transition on bridges be avoided? (I - 202.5(4))

11. Is the superelevation transition for compound curves designed in accordance with Figure 202.6? (I - 202.6)(A)

12. Do superelevation rates of local streets and roads which are within the State right of way (with or without connection to State facilities) conform to AASHTO standards? (I - 202.7)(M)
If the local agency standards exceed AASHTO standards, do the local standards prevail? (A)

E. Geometric Cross Section

1. Basic Roadway Widths/Number of Lanes

a. Does the proposed number of lanes provide adequate capacity and LOS for the design hourly volume based on the methodology discussed in Topic 102?

b. For projects which include the construction or reconstruction of local streets and roads:

1) If the local facility is a Federal-aid route, does the proposed width conform to AASHTO standards? (I - 308.1)

2) If not a Federal-aid route, does the proposed cross section match the local agency standard or the width of the adjoining (existing) section? (I - 308.1)

3) Has the State highway undercrossing span length been designed to accommodate the future requirements of the local facility as discussed in Index 208.1(2)(b) ?

4) Where a local facility crosses over or under a freeway or expressway, but has no connection to the State facility, does the minimum cross section conform to AASHTO standards? (I - 308.1)(M)
Is the minimum width of a 2-lane overcrossing structure at least 8.4 m curb to curb? (I - 308.1)(M)

5) Where a local facility crosses over or under a freeway or expressway and connects to the State facility, does the minimum cross section meet the standards for a conventional highway with the exception that the outside shoulder width shall match the approach roadway, but not less that 1.2 m? (I - 308.1)(M)

Where bicycle use is expected are shoulders at least 1.5m? (I - 308.1)(A)
Is the minimum width of a 2-lane overcrossing structure 12.0 m curb to curb? (I - 308.1)(M)

2. Traffic Lane and Shoulder Widths, and Cross Slopes

   a. Are all lanes 3.6 m wide? (I - 301.1)(M)

   b. On new or reconstructed highways, is the traveled way cross slope 2%? (I - 301.2 (a))(M)

   c. On resurfacing and widening projects, is the traveled way cross slope between 1.5% and 3% and does it match the existing? (I - 301.2(b))(M)

   d. Is the maximum algebraic difference in cross slope:

      1) 6% or less between adjacent lanes of opposing traffic for rehabilitation and widening projects? (I - 301.2)(A)

      2) 4% or less between adjacent lanes of opposing traffic for new construction? (I - 301.2)(M)

      3) 4% or less between same direction traffic lanes of divided roadbeds? (I - 301.2)(A)

      4) 8% or less between the traveled way and shoulder? (I - 301.2)(A)

   e. Are the shoulder widths specified in Table 302.1 provided? (I - 302.1)(M)

   f. Do shoulders to the right (on normal tangents) slope away from the traveled way at 5%? (I - 302.2) (M)

      For additional drainage capacity: (I - 307.2)

      2- lane highways with 1.2 m shoulders and dike, slope may be increased to 7%.

      2-lane highways with 0.6 m shoulders without dike, use 2% slope. With dike, slope may be increased to 9%.

   g. Do shoulders to the left (on divided cross sections) slope:

      1) in the plane of the traveled way when the median is paved? (I - 302.2)(M)

      2) at 2% away from the traveled way when the median is depressed? (I - 302.2)(M)

3) in the plane of the traveled way when future widening will utilize shoulders? (302.2(3))(M)

4) at 2% away from the traveled way for separate road ways? (I - 302.2)(M)

h. Do through lane drops and lane width reductions have a minimum length of 2/3WV? (I - 206.3)(A)

3. Median Standards

a. Are the minimum median widths provided, based on facility and land use? (I - 305.1)(A or M)

b. Has the median width been selected to provide standard shoulder width and horizontal clearance to overcrossing structure piers? (T - 302.1 & I - 309.1(3))(M)

c. Is curb use in the median in compliance with the restrictions of Topic 209 and Index 405.5(1)? (I - 305.4)(A)

d. Do median openings comply with requirements in Index 405.5?

4. Bridges and Grade Separations [also see Part E.1.b above]

a. Does the clear width of each bridge at minimum equal the width of the approach roadway (traveled way & paved shoulders)? (I - 208.1)(M)

b. Where bridges are constructed on 2 - lane highways to replace existing bridges, is the clear width at least 9.6 m? (I - 208.1(1))(M)

c. Where the approach shoulder width is < 1.2 m is the minimum offset on each side 1.2 m? (I - 208.1(1))(M)

d. Is the cross slope across the structure the same as that of the approach roadway? (I - 208.2 & I - 301.2)

e. Have bridge medians 10.8 m wide or less been decked? (I-208.3)(A)

f. Are sidewalks on bridges justified by pedestrian traffic? (I-208.4)

g. Are embankment end slopes at open end structures no steeper than 1:1.5? (I-208.5)

h. Has protective screening been included in the design along new overcrossing structure sidewalks in urban areas? (I - 208.10(2))

5. Side (Cut & Fill) slopes

   a. Have the following been considered in slope design: (I - 304.1)

      1) Compliance with the Project Materials Report recommendations?

      2) Ease and cost of long-term maintenance?

      3) Appearance (aesthetics)?

      4) Traffic Safety?

      NOTE: Slopes 1:3 or flatter generally do not require MBGR.

   b. Are cut and fill slopes on freeways and expressways 1:2 or flatter? On other highway facilities 1:1.5 or flatter? (I - 304.1)

   c. Is a uniform catch point of at least 5.5 m used in light grading where normal slopes catch less than 5.5 m from the ES? (I - 304.1)(A)

   d. Where appropriate, has snow removal been considered in slope design? (I - 304.1)

   e. Is a minimum clearance of at least 3 m provided between the right of way line and the catch point of a cut/fill slope (see I - 304.2 for specific conditions)? When feasible, is 5 m provided?

   f. Are slope benches and cut widening designed in accordance with Index 304.3 and the Project Materials Report? (I - 304.3)

   g. Have contour grading plans been prepared? Slope rounding? (I - 304.4)

   h. Have "steps" been designed into cut slopes to encourage revegetation from adjacent plants? (I - 304.5)

6. Frontage Roads

   a. For urban areas:

      1) Is the cross slope between adjacent lanes of opposing traffic 6% or less for rehab and widening projects? (I - 301.2)(A)

      2) Is the cross slope between adjacent lanes of opposing traffic 4% for new construction? (I - 301.2)(M)

      3) Is the width of outer separation (see F - 307.4) at least 8 m? (I - 310.2)(A)

4) Is the minimum paved width of two 3.6 m lanes with 1.2 m outside shoulders provided? (I - 310.1)(M)

b. For rural areas:

1) Is the minimum paved width of 7.2 m provided? (I - 310.1)(M)

2) Is the width of outer separation at least 12 m ? (I - 310.2)(A)

7. Right of Way

a. When a project requires right of way acquisition, have future needs and current standards been considered in the establishment of ultimate R/W needs?

8. Clearances

a. Horizontal

1) Have all fixed objects within the clear recovery zone (CRZ) been eliminated, moved, shielded, or redesigned to be made yielding as specified in Index 309.1? (A)

2) Has the minimum horizontal clearance (i.e., standard shoulder width, but not less than 1.2 m) been provided to fixed objects, either shielded or unshielded, within the CRZ? (I - 309.1)(M)

3) Have horizontal SSD requirements been met where it is planned to use the minimum horizontal clearance to barriers, walls, or cut slopes? (I - 309.1(1))(M)

4) When located 4.5 m or less from the ETW, has the noise barrier been placed on a safety shape barrier? (I - 1102.2)(M)

5) In areas without curbs, has safety shaped barrier face been specified when any retaining, pier, or abutment wall is less than 4.6m from ETW? (I - 309.1)(A)

6) For bridge deck widening projects, has the District Permit Engineer provided the minimum width of roadway openings between temporary K-rail? (I - 309.1(3))

b. Vertical

1) Are the minimum vertical clearances to major structures provided as specified? (I - 309.2(1))(M)

2) Is the vertical clearance to pedestrian overcrossings 0.5 m greater than the clearance provided for standard major structures on the facility? (I - 309.2(2)(M)

3) Do all sign structures have a minimum vertical clearance of 5.5 m? (I - 309.2(2)(M)

4) If the project is on the 42,000 km Priority Network, are minimum vertical clearances provided? (I - 309.2(3))(M)

5) Are all structures within Federal-aid participation limits? (I - 309.2(5))

6) Do vertical clearances over RR facilities have a minimum clearance of 7.01 m? (I - 309.5(1)(A)

7) Has the Regional Permit Manager been involved in the decision to modify existing vertical clearance?

c. Tunnels

1) Have the minimum horizontal and vertical clearances specified in Index 309.3 been provided? (A & M)

d. Elevated Structures

1) Have the minimum lateral clearances between highway structures and buildings or other highway structures been provided? (I - 309.4) (M)

e. Falsework

1) Has Table 204.6 been used in the determination of traffic opening widths through falsework? [I - 204.6(5)](A**)

** requires District Director's approval and Project Development Coordinator's concurrence.

2) Where temporary K-rail is used to protect falsework, has space (0.6 m min.) been provided for its deflection? (I - 204.6(5))

3) Has a minimum vertical clearance of 4.6 m been provided for falsework? (I - 204.6(5))(M)

f. Airway - Highway

1) When construction is planned near an airport or heliport (civil or military), have the clearance requirements of Topic 207 been met or exceeded?

2) If applicable, have the procedures for submittal of clearance data been followed? (I - 207.3)

g. Railroad

1) Have the PUC established clearances between railroads and grade separation or parallel highway structures been provided? (I - 309.5)

2) If a railroad is involved, or is in the vicinity of a project, has the RR and PUC granted project approval?

F. At-Grade Intersections

1. Has design year traffic data been developed from recent counts (for projects involving revisions to existing intersections), or from traffic forecasts (for new intersections)? Have truck, pedestrian, and bicycle traffic been considered in development of traffic data?

2. Based on accepted capacity analysis methodology, does each intersection provide adequate capacity to handle peak period traffic demands? (For unsignalized intersections use Ch. 10 of the 1994 HCM; for signalized intersections see Topic 406.) Have critical lane analysis for each intersections been completed? (See Figures 406 A, B, & C as examples)

3. Upon review of each intersection, have the following geometric features been eliminated or minimized?

a. Inadequate stopping and corner sight distance

b. Steep grades

c. Inappropriate traffic control

d. Presence of curves within intersections

4. Are skewed intersections greater than 60 degrees (75 degrees preferred) variance from a right angle? (I - 403.3)(A)

5. Is striping used in lieu of curbs to delineate islands adjacent to high-speed traffic? (I - 405.4(2))

6. If curbing must be used, have mountable types been considered? (I - 405.4(2))

7. Truck Turn Templates.

a. Has the STAA truck turn template been used in the design of all interchanges (i.e., ramp intersections) on the National Network and on

routes leading to and from designated service and access points? (I-404.3(2))(A)

b. Has the California truck turn template been used in the design of intersections not on the National Network? (I-404.3(3))(A)

8. Sight Distance Requirements

a. Is Corner Sight Distance provided at each unsignalized public road intersection? (I - 405.1(2))(A)

b. Where restrictive conditions exist at public road intersections, does the measured corner sight distance equal or exceed the Stopping Sight Distance? (I-405.1(2)(b))(M)

c. In the determination of corner sight distance, is a minimum of 3 m plus the shoulder width of the major road, but not less than 4 m, used for driver setback? (I-405.1(2)(a))(M)

d. For private road intersections, does the measured corner sight distance equal or exceed the SSD? (I - 405.1(2)(c))(M)

e. At intersections where a State highway route turns across or crosses another State highway, is Decision Sight Distance provided? (I - 405.1(3))(A)

f. Where grades exceed 3% and are longer than 2 km, where there are high truck volumes on the crossroad, or where the intersection is skewed, was consideration given to increasing the Corner Sight Distance values? (I-405.1(2)(a))

9. Channelization

a. Has the District Traffic Branch determined, or at least concurred with, the need for a separate left-turn lane? (I-405.2(1))

b. Have double left-turn lanes been considered at signalized intersections on multilane highways where the left-turn demand exceeds 300 vehicles per hour? (I-405.2(3))

c. Are both single and double left-turn lanes at least 3.6 m wide each? (I - 405.2(2)(a))(M)

d. Do the approach taper and deceleration lane designs meet or exceed the minimum lengths recommended in Figure 405.2A and Table 405.2B? Has storage length been considered? (I - 405.2(d))
Lesser designs (see Figures 405.2b and 2c) may be acceptable in urban areas where constraints exist, speeds are moderate, and traffic volumes are relatively low.

e. Do right-turn lane designs satisfy the same requirements discussed above (items 9a and 9d) for left-turn lanes?

f. Are right-turn lanes at least 3.6 m wide? Is the shoulder width adjacent to any right-turn lane at least 1.2 m? (I-405.3(2)(a)(M)

g. At off-ramp terminals, are "free" right turns avoided? If not, is a minimum 60 m acceleration lane or lane addition provided on the local street, and no left turn movements within 125 m? (I - 504.3(2))(A) and (I - 405.3(3))

h. Do traffic islands conform to Index 405.4?

10. Are curbs limited to highway facilities where the running speeds are less than 75 km/h? (I - 209.1)(A)

10a. Where speeds are under 75 km/h in urbanized areas with curbed medians, are 0.6 m left shoulders provided? (Table 302.1, note (5))(M)

11. Are median openings spaced at least 500 m apart? And have median opening locations within 100 m of an access opening or street intersection been shifted to be directly opposite such intersections? (I - 405.5) & (I - 104.5)(A)

12. Have emergency passageways been located where decision sight distance is available? (I - 405.5)(A)

13. On expressways, are access openings spaced at least 1 km from adjacent public road intersections, or to another private road access opening that is wider than 10 m? (I - 205.1)(A)

13a. Is Stopping Sight Distance provided? (I - 205.1)(M)

14. Do urban driveway designs meet the width, spacing, and surfacing requirements of Index 205.3 and the construction details of the Standard Plans?

15. For driveways on frontage roads or on rural highways, does the proposed driveway width accommodate the maximum legal vehicle's turning radius?

16. On signal installation projects on two-lane highways where widening is needed for adequate operation of the intersection, have the minimum design requirements of Figure 405.9 been met or exceeded? (I - 405.9)

17. Is the design "pedestrian friendly"? For example, does the design include adequate signal phasing and refuge areas to minimize pedestrian/vehicle conflicts in the intersection?

18. Wheelchair Ramps

a. Is reasonable access provided to individuals with disabilities at bridge sidewalk approaches and at curbs in the vicinity of pedestrian separation structures? (I - 105.4(1)(A)

b. For new construction, are two ramps proposed at each corner? (I - 105.4(2)(A)

c. In retrofit situations, is the one-ramp design proposed only where the volume of right-turning vehicles is low? (I - 105.4(2))(A)

d. Are ramps and/or curb openings provided at midblock crosswalks and where pedestrians cross curbed channelization or median islands? (I - 105.4(2))(A)

e. Has consideration been given to retrofit all corners of an existing intersection even though the project scope does not disturb each corner? (This is now required.) (I - 105.4(2))(A)

f. Does each ramp design conform to the current Standard Plan? (I - 105.4(3))(A)

g. When a ramp or facility access design varies from the Standard Plan, has DSA approval been requested?

h. Have driveways been designed to be traversable as shown in the Standard Plans?

19. Have intersection designs been reviewed by the appropriate FHWA and HQ-SLPD and Traffic Operations Reviewers?

20. Pedestrians See Traffic Manual Chapters 6 and 10, the Project Development Procedures Manual, and Topic 105 of the HDM.

a. In rural or suburban areas, physical conditions may force students to walk on roadways. In these conditions, have 2.4 m shoulders been used or a separated walkway at least 1.2 m wide provided?

b. Is a pedestrian O.C. warranted? (I-105.2)

c. Is the minimum width for the pedestrian O.C. 2.4 m ? (I - 208.6)(A)

d. Are pedestrian ramps provided on all pedestrian separation structures? (I - 208.6)(A)

G. Interchange Design Criteria

1. Are the minimum Interchange (I/C) spacing requirements satisfied by the design? (I - 501.3)(M)

2. Are all traffic movements provided for at each proposed local street I/C so as to minimize the possibility of wrong-way movements? In other words, have isolated ramps and partial interchanges been avoided? (I-502.2)(A)

3. At freeway-to-freeway (F - F) interchanges, does the sign route (and major traffic volume) move to the left? (I - 502.3)

4. Have F-F I/Cs been reviewed to determine if any turning movements are so minimal that they need not be provided for? If they are identified, have they been discussed with SLPD and FHWA reviewers? (I - 502.3(2)(c))

5. Do loop ramp/connectors have radii in the range of 50 m - 65 m as measured to the left ETW of the outer most lane of multilane facilities? (I - 502.3(2)(e))

6. Do direct connectors have minimum radii of 260 m? Radii of at least 350 m are desirable. (I - 502.3(2)(e))

7. Has each I/C design been reviewed by the appropriate SLPD (Geometrician and Project Development Coordinator) and FHWA Transportation Engineer? (I - 503.2)

8. Has Decision Sight Distance been provided at all freeway exits and branch connectors? (I - 504.2(4)(a))(A)

8a. Has a minimum Decision Sight Distance of 190 m been provided at secondary exits on Collector - Distributor (C-D) roads? (I - 504.2(4)(a))(A)

9. Is the maximum ramp profile grade 8% or less? A maximum grade of 9% is allowed on descending entrance ramps (except loops) and ascending exit ramps. The 1% steeper grade should be avoided on descending loops. (I - 504.2(5)) & (I-204.3) (A)

10. Is the maximum profile grade on F-F direct connections 6%? (I - 504.4(3))(A)

11. Is the vertical curve beyond the nose of each freeway exit designed to provide a minimum 80 km/h Stopping Sight Distance? (I - 504.2(5)(a))(A)

12. Does the on-ramp profile parallel (approximately) the mainline profile for at least 30 m prior to the inlet nose to provide intervisibility to facilitate merging? (I - 504.2(5)(b))

13. For ascending off-ramps joining the crossroad, if the ramp ends in a crest vertical curve, does the last 15 m of ramp have a profile grade of 5% or less? (I - 504.2(5)(a))(A)

14. For descending off-ramps, is the sag vertical curve length at the ramp terminal at least 30 m? (I-504.2(5)(a))(A)

15. At overcrossing I/Cs, do all the ramps intersect the crossroad where it's profile grade is 4% or less? (I-504.3(2))(A)

16. For left-turn maneuvers from an off-ramp at unsignalized ramp intersections, is the 7-1/2 second sight distance criteria shown in Figure 504.3A provided? ((I - 504.3(2))(A)

18. Is a minimum of 125 m, 160 m preferred, provided between each ramp intersection and the adjacent local street intersection? (I - 504.3(2))(M & A)

19. Is 5% the maximum algebraic difference in pavement cross slope between adjacent traffic lanes, or between a traffic lane and the adjacent gore area? (I - 504.2(5)((A)

20. Where ramps have a curve radii $\leq$ 90 m with a central angle >60 degrees, have they been widened for trucks in accordance with Table 504.3? (I - 504.3(1)(b)) (M)

21. Does each freeway entrance and exit ramp connect to the right of through traffic? (HOV "drop" ramps may enter and exit the freeway from the median) (I - 504.2(1))(M)

22. Does each entrance and exit design conform to the requirements of Figure 504.2A (single lane), and Figure 504.3C (two lane entrances and exits), and/or Figure 504.4 (diverging branch connections)? (I - 504.2(2))(A)

23. Has the need for an auxiliary lane to facilitate the merging of trucks been considered where the physical and traffic conditions cited in Index 504.2(5)(b) are present? (A)

24. Where a cut slope restricts the standard decision sight distance to an exit ramp, and cut widening is not feasible, has an auxiliary lane been provided in advance of the exit? (I - 504.2(3))(A)

25. Has a design speed of 80 km/h been provided at the exit nose of both ramps or branch connections? (I - 504.2(4)(a))(A)

26. Prior to the first curve of a freeway exit, has the standard deceleration distance "DL" been provided in accordance with Figure 504.2A? Has "DL" been provided for the first curve after the exit from a C-D road? (I - 504.2(2))(M & A)

27. Where exit ramps are preceded by or located on sustained and significant downgrades, has additional "DL" distance been provided (see AASHTO Green Book methodology)? (I - 504.2(2))

28. If the exit nose is located downstream of the 7 m dimension, is the maximum paved width between the mainline and ramp shoulder edges 6 m? (I - 504.2(2))(A)

28. Is the design speed at the inlet nose consistent with the approach alignment? For branch connections, or diamond ramp with high speed alignment, is the design speed at the inlet nose at least 80 km/h? (I - 504.2(4)(b))(A)

29. Is the design speed on each branch connection a minimum of 80 km/h? (I - 504.4(2))(A)

30. Regardless of the horizontal curve radius used, does the vertical alignment of each branch connection provide SSD consistent with approaching vehicle speeds? (I - 504.4(2))(A)

31. Does each ramp terminus design provide for a minimum design speed of 40 km/h? (I - 504.3(1)(a))(A)

31a. When a "through" movement is provided at the ramp terminus, is the minimum ramp design speed at least equal to the design speed of the facility for which the through move is provided? (I - 504.3(1)(a))(A)

32. On a single lane ramp where additional lanes are provided near the entrance ramp intersection, is the lane drop accomplished over a distance equal to 2/3WV? Is the lane dropped on the right? (I - 504.3(4))(A)

33. Where the length of any single-lane ramp exceeds 300 m, has widening to two lanes to permit passing been considered? (I - 504.3(4))(A)

34. Excluding ramp metering retrofit projects, is the lane drop taper on a two-lane entrance ramp equal to 50:1? (F - 504.3C)(A)

35. Where design year traffic volumes exceed 1,500 equivalent passenger cars per hour, has a two-lane width of exit ramp been provided? (I - 504.3(5))(A)

36. Is a 400 m length of auxiliary lane provided prior to each two-lane exit ramp? (I - 504.3(5))(A)

37. Where design year volumes range between 900-1,500 vehicles per hour (vph), has a single lane exit been designed with provisions for the addition of a second lane and the standard auxiliary lane? (I - 504.3(5))(A)

39. Is there at least 300 m between successive on-ramps, or if less than 300 m, is there an auxiliary lane between the ramps which is carried beyond the second entrance ramp? (I - 504.3(8))(A)

40. Is there at least 300 m between successive exit ramps from freeways and expressways? Also, is there at least 180 m between successive exit ramps from Collector-Distributor (C-D) roads? (I - 504.3(9))(A)

41. Are curbs avoided on the high side of ramps or in exit ramp gore areas? (C-D roads are O.K.) (I - 504.3(10)(e))

42. On freeway-to-freeway connectors:

    a. Where DHV exceeds 1500 equiv. pcph, has more than one lane been provided? (I - 504.4(6))(A)

    b. Where DHV ranges between 900 and 1500 pcph, has a single lane been proposed with provisions for additional lanes? (I - 504.4(5))(A)

    c. Has a single lane connector longer than 300 m been widened to two lanes with minimum 1.5 m shoulders to facilitate passing? (not needed for capacity) (I - 504.4(5))(A)

    d. Is the length of any lane drop taper not less than 2/3WV? (I - 504.4(7))(A)

43. Are merging and diverging branch connections designed in accordance with Figures 504.3C and 504.4, respectively? (I - 504.4(6))(A)

44. At a branch merge, has a 800 m length of aux. lane been provided beyond the merge of one lane of the inlet? (I - 504.4(6))(A)

45. At a branch diverge (Figure 504.4), has a 800 m length of aux. lane been provided in advance of the exit? (I - 504.4(6))(A)

46. Where the weaving distance between successive entrance and exit ramps (Figure 504.2A) is less than 600 m, has an aux. lane been provided between these ramps? (I - 504.5)(A)

47. Have the basic number of lanes been maintained through each local interchange? (I - 504.6)(A)

48. Where a reduction in mainline traffic volume is sufficient to warrant a decrease in the basic number of lanes, is the lane drop located beyond the influence of the I/C (at least 1 km from nearest inlet or exit nose), and does the lane drop occur on the right lane on a tangent with a straight or sag profile? (I - 504.6)

49. Have the lengths of weaving sections been determined from Figure 504.7A or from Traffic Bulletin No. 4? (I - 504.7)

50. Have the weaving sections in: I - 504.7

    a. Urban areas been designed for LOS C-D? (A)

    b. Rural areas been designed for LOS B-C? (A)

51. On main freeway lanes, is the weaving length defined on Figure 504.2A at least 500 m? And has an additional 300 m been added for each additional lane to be crossed by weaving vehicles? (I - 504.7)(A)

52. Does the ramp design provide for future expansion and/or retrofitting for ramp meter installation (including HOV bypass lane)?

53. Where multi-lane ramps are metered, is the lane drop taper past the meter limit line:

    a) 50 to 1 or greater?

    b) 30 to 1 or greater? (I - 504.3(1)(d))(A)

    c) 15 to 1 or greater? (I - 504.3(1)(d))(M)

54. Do multi-lane ramps complete the lane-drop taper by the 2 m separation point when no auxiliary lane is provided? (I - 504.3(1)(d))(A)

    Where an auxiliary lane is provided, is the lane-drop transition completed by the convergence point? (Ramp Metering Guidelines, 9/93) & (F - 504.3C)(A)

55. Have access rights been acquired along interchange ramps to their junction with the nearest public road? At these junctions, does access control extend at least 15 m beyond the end of the curb return, ramp radius, or taper? (I - 504.8) (M)

56. For new construction, does access control extend 30 m beyond the end of curb return or ramp radius in urban areas and 100 m in rural areas, or as far as necessary to ensure that entry onto the facility does not impair operational characteristics? (I - 504.8)(A)